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Plant Development Workshop.

No. 12.

Announcing

The 12th. Plant Development Workshop will be held at McMaster University on Saturday, April 9th. The meetings will be held in Room 1A4 in the Health Science Centre.

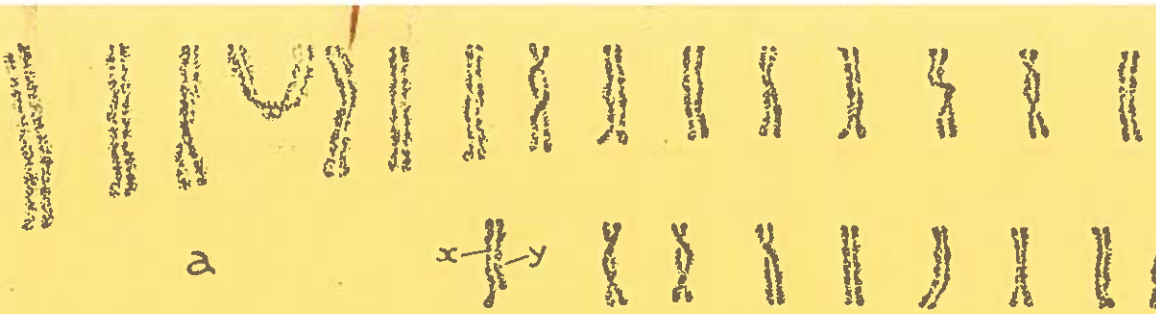
A guest speaker has agreed to join us; Dr. John Mitchell will report on his recent work on DNA and protein changes during differentiation in peas. I would welcome reports on related topics, e.g. chromatin, genome and nuclear organization in development and in response to external agents.

Abstracts on all topics in plant development will be welcome. Please submit your abstract, in the box provided, by March 30th.

Preliminary Schedule:

9.00 - 9.30	Coffee and Registration
9.30 -12.00	Contributed Papers
12.00 - 2.00	Lunch
2.00 - 4.00	Contributed Papers

Abstract to: Dr.D.Davidson, Biology Dept. McMaster University, Hamilton, Ont. L8S 4K1.



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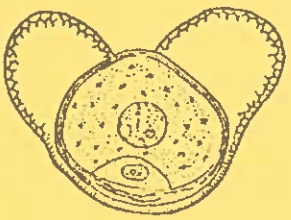


WHAT: **PLANT DEVELOPMENT WORKSHOP #13**

WHEN: Saturday, November 5, 1983

WHERE: University of Western Ontario, London, Ontario

WHO: Graduate Students and Supervisors and Other Researchers in Plant Development

PRELIMINARY SCHEDULE:

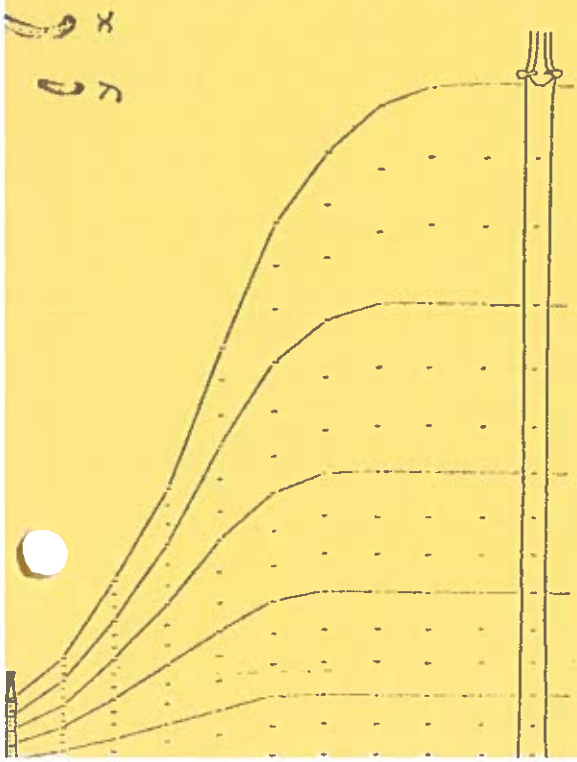
9:00 - 9:30 a.m.	
9:30 -12.00 a.m.	Contributed Papers
12:00 - 2:00 p.m.	Lunch and Post Presentation
2:00 - 4:00 p.m.	Contributed Papers

NOTE: Please supply title and abstracts by Oct. 28.
Please let us know the number from your group attending by November 2, 1983.

ALL COMMUNICATIONS TO:

Dr. R. I. Greyson
Department of Plant Sciences
University of Western Ontario
London, Ontario
N6A 5B7

Phone (519) 679-3107
Leave a message at (519) 679-3102



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McMaster. April 9. 1983.

PLANT DEVELOPMENT WORKSHOP : TWELTH MEETING.

9.00 - 9.30am Coffee

9.30 - 9.50. S.W.Armstrong: RNA synthesis in binucleate cells.

9.50 -10.30. J.P.Mitchell: Nuclei and Nucleoli (no abstract available).

10.30 - 10.45 Coffee

10.45 - 11.05. A.J.Hilliker: Chromosome arrangement during interphase.

11.05 - 11.25. D.Davidson: Delayed response to maleic hydrazide.

11.25 - 11.45. R.L.Peterson: Root apex structure in Ephedra.

11.45 - 12.05. J.N.A.Lott: Studies of globoid crystals in seed protein bodies.

LUNCH and POSTERS

2.00 - 2.20. M.Dijak: Growth and development of Glycine max.

2.20 - 2.40. F.R.Pick: Epifluoresence of picoplankton.

2.40 - 3.00. D.T.Webb: Comparative in vitro studies of cycad root nodulation.

3.00 - 3.20. Y.Piche: Compatibility in ectomycorrhizal assocaitions.

Post-papers and Post-discussions Soiree.

45 attended.

Dr. John Mitchell. Dept. of Botany, The Ohio University, Athens, Ohio.

D. Davidson, E. Pertens and S.W. Armstrong. Department of Biology, McMaster University, Hamilton. RNA Synthesis in Binucleate Cells: Stimulation by Colchicine.

Total cell growth and, in particular, RNA synthesis, are inhibited by caffeine. Caffeine also induces binucleate cell formation and the binucleate cells are known to be stimulated by colchicine: they complete interphase and enter mitosis earlier than binucleate cells not treated with colchicine. This response may involve the depolymerization of microtubules since taxol, a drug which stabilizes microtubules, reverses the stimulating effect of colchicine. Pea roots were treated with caffeine and 4 hr later were allowed to incorporate ^{3}H-uridine. Other roots were treated with caffeine and then with colchicine before exposure to ^{3}H-UR. Mean grain counts were determined over nuclei and cytoplasm in binucleate cells. The mean nuclear counts were 9.91 ±5.7 for cells treated only with caffeine and 11.97 ± 6.1 for cells treated with caffeine and colchicine. Total cell counts for the two treatments were 30.46 and 36.58. Both pairs of values are significantly different ($p=0.05$). Thus, colchicine stimulates RNA synthesis in nuclei of caffeine induced binucleate cells. Both sister nuclei respond, since the correlation coefficients are $r=0.796$ and $r=0.764$ for the two treatments. The results show that colchicine induced release from caffeine inhibition includes a response at the level of DNA transcription.

A.J. Hilliker, Department of Botany and Genetics, University of Guelph. Chromosome arrangement during interphase.

Little is known of the arrangement of chromosomes during interphase - the portion of the cell cycle associated with most somatic gene transcription. We have determined the nature of the relative arrangement during interphase of chromosomes in a specific cell type of Drosophila. Two major features of interphase chromosome arrangement were discovered. First, each chromosomal arm occupies a specific domain within the interphase nucleus which does not appreciably overlap with those of other arms. Second, within these chromosomal domains DNA folding is very extensive. These may be general properties of higher eukaryote interphase nuclei.

Delayed Response to Maleic Hydrazide in Vicia faba. D. Davidson, Biology Department, McMaster University, Hamilton.

Seeds of Vicia faba were treated with 1mM maleic hydrazide for 4 hr; i.e. at 20 to 24 hr from the time of sowing. Most nuclei are in G_1 at the time of treatment. At 2 and 3 days cell enter their first mitosis since treatment: they show typical patterns of chromatid breakage and reunion. The fate of the cells with altered karyotypes was tested by examining mitotic division in primordia and in emerged lateral roots 6 to 8 days after treatment. Cells with aberrant karyotypes were found. In 332 metaphases, 29 had stable changes e.g. chromosome deletions: 22 had a single arm deletion and 7 had an additional fragment chromosome. But there were also 15 cells with chromatid aberrations, i.e. breaks and reunions. These must have arisen in the interphase immediately preceding the mitosis in which they were seen. And this means chromatid aberrations typically seen at the first metaphase after treatment with maleic hydrazide are still appearing some 10-15 cell cycles later. The results will be discussed in terms of delayed response to treatment and of the survival of cells heterozygous for a deletion.

Root apex structure in Ephedra. R.L. Peterson. Botany and Genetics, University of Guelph, Guelph, Ontario N1G 2W1

Ephedra is a specialized, shrubby gymnosperm found in various arid regions. The root of this genus has a quiescent centre present in the meristem and an exceptionally long root cap. Distinctive, large cells in the central region of the root apex which do not incorporate ^{3}H-thymidine and stain lightly with Feulgen reagent, comprise the quiescent centre. Nuclei of these and adjacent meristem cells remain at the 2C-4C level of DNA. Ultrastructurally, cells of the quiescent centre are characterized by possessing proplastids, numerous ribosomes, small vacuoles and few plasmodesmata. The root cap consists of a columella and periphery. Nuclei of columella cells are either at the 2C or 4C level of DNA as determined by microspectrophotometry. The mitotic index remains high up to 50 cell tiers from the quiescent centre - root cap boundary and therefore the root cap of this genus is unique in its method of growth. Starch deposition is delayed considerably in columella cells but not in peripheral cells.

Studies of the Uniformity of Elemental Composition in Different Areas of Globoid Crystals in Seed Protein Bodies.

J.N.A. LOTT AND C.M. VOLLMER
Department of Biology, McMaster University, Hamilton, Ontario, Canada.

Seed protein bodies contain dense inclusions, the globoid crystals, which are thought to be rich in phytin. In the past we have used energy dispersive x-ray analysis to study protein body-to-protein body, cell-to-cell, and tissue-to-tissue differences in the elemental composition of globoid crystals. Due to improved technology (VG model HB5 scanning transmission electron microscope with a Kevex Quantex-Ray Micro-X7000 system), we can now study many areas within individual globoid crystals to determine the uniformity of elemental composition. Our studies indicate that globoid crystals from Cucurbita maxima cotyledons are of relatively uniform composition. Some globoid crystals from Ricinus communis endosperm show distinct internal differences in calcium content.

Dijak, M. and D.P. Ormrod. Growth and development of Glycine max under fluorescent light alone or supplemented with incandescent light.

The fluorescent tube is a frequently used light source for plant growth; numerous researchers have noted that dry matter accumulation is greatly enhanced by supplementing with incandescent light. At sequential harvests made during vegetative growth, Glycine max 'Maple Arrow' supplied with fluorescent light alone had lower leaf areas and leaf, shoot, root and plant total dry weights than plants supplied with fluorescent plus incandescent light. Absolute growth rates were higher under supplemented conditions; however, relative growth rates were not significantly different for plants grown under the two conditions. In contrast, when relative growth rates during the first ten days after emergence were determined, it was found that both absolute and relative growth rates were higher under supplemented conditions. Dry matter production was altered by switching plants to alternate growth light conditions, with effects depending on when the switch was made. Leaf temperature was studied at several growth stages and was approximately 1 C higher under supplemented conditions. There appeared to be a critical period of plant adaptation, after which relative growth in the two conditions was parallel.

Epifluorescence microscopy of picoplankton.
F.R.Pick, Department of Biology, McMaster U., Hamilton.

Bacteria and the picoplankton (0.2-10 um) in general are mainly responsible for heterotrophic and autotrophic processes both in marine and freshwater systems. However, their detection and enumeration are often very difficult. In the last ten years the use of epifluorescence microscopy, in combination with DNA-specific or protein specific fluorescent dyes or natural autofluorescence, has improved direct counting techniques of these organisms. Modifications of these techniques will be discussed which allow a distinction to be made between bacteria and cyanobacteria of similar size and between photosynthetic and heterotrophic flagellates of similar size.

David T. Webb, Department of Biology, Queen's University, Kingston, Ontario K7L 3N6. "Comparative In Vitro Studies of Cycad Root Nodulation".

With aseptically cultured cycad seedlings, four distinct patterns of root development have been observed. With Macrozamia communis apogeotropic nodules develop at the root-shoot junction in darkness. Acropetally formed lateral roots have pointed tips and are either ageotropic or plagiotropic, and they are converted into apogrotropic root nodules by light. A similar response was shown by Encephalartos altensteinii except that dark-formed apogeotropic roots were not nodular. With Zamia pumila, Z. furfuraceae, Bowenia serrulata, and Cycas revoluta nodulation and apogeotropism were absent in darkness, but light caused nodulation in all cases. Light also induced apogeotropism with Z. pumila. With Dioon edule, apogeotropism and nodulation were not observed in either light or dark culture.

In all cases, except D. edule, light severely inhibited lateral root production, and root elongation.

Light induced callus formation by primary and secondary roots of D. edule. Light also caused subapical callus formation with Z. furfuraceae and C. revoluta. C. revoluta roots also formed callus in darkness.

Compatibility in ectomycorrhizal associations. Y. Piché, R.L. Peterson and C.A. Ackerley, Department of Botany and Genetics, University of Guelph, Guelph, Ontario N1G 2W1

The environmental conditions leading to the formation of ectomycorrhizae have been extensively studied but the early colonization events need to be examined more closely. Our recent T.E.M. and S.E.M. studies have shown that when Pisolithus tinctorius hyphae make their first contact with Pinus strobus roots, Thiéry-positive deposits are present. These surface secretions have been related respectively to the mucilage of the host roots and exopolysaccharides of the ectomycorrhizal fungus. The presence of these amorphous materials between interacting cells may suggest complementory receptors on cell surfaces of the symbionts. These carbohydrate determinants are probably relatively common substances in the mucilage since there is little specificity in recognition exhibited, i.e. Pisolithus tinctorius can form ectomycorrhizae with over 70 tree species. The term compatibility in ectomycorrhizae associations should be employed therefore to describe the adhesion of the ectomycorrhizal fungi to the root surface. This attachment could be necessary and concomitant to the positive recognition between the carbohydrate determinants implicated.